D422-MG

RS-422 Multiplexer with GPI I/O

User manual

Rev. H

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Revision history

Current revision of this document is the uppermost in the table below.

Rev.	Repl.	Date	Sign	Change description
H	G	2015-05-13	MB/JD	Cover page update; DoC removed; Changed A1 Materials declaration (product is now PB free); Removed products D-422-MG-13T 0 dBm and D-422-MG-15T 0 dBm
G	6	2012-12-27	JD	Corrected pinning for D422-MG-C3 in chapter 4.2
6	5	2011-09-28	JD	Added information on remote control of Flashlink / FlashCase
5	4	2011-08-15	MS	Added single slot backplane for FlashCase
4	3	2009-07-30	OEH	Added single slot backplane pinning
3	2	2008-07-24	AS	Added Declaration of Conformity.
2	1	2007-10-25	AS	New front page.
1	0	2007-10-05	AS	Added Materials Declaration and EFUP
0	C	2006-05-11	OEH	GPI monitoring and control via GYDA Added RS422 VTR master and slave pinouts
C	B	2004.06.08	OEH	Added CWDM channels 9-16.
B	A	2004.05.28	OEH	Added power/latency specification.
A	-			Preliminary version. Pre production run.

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1 Product overview

1.1 General

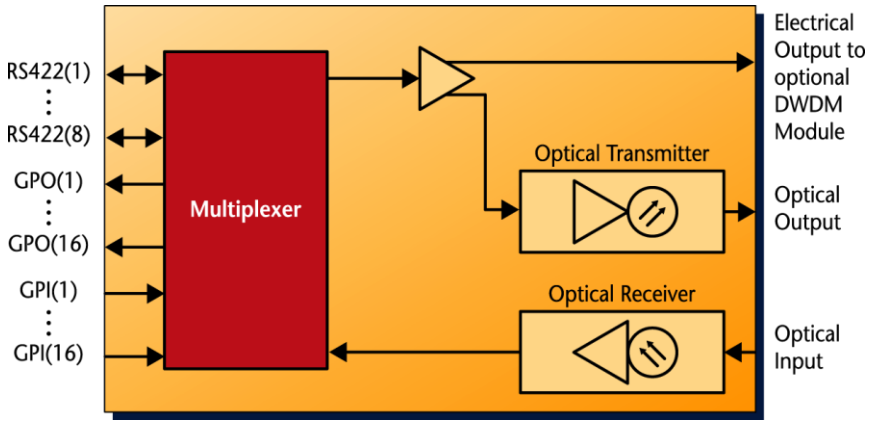


Figure 1: D-422-MG Block diagram

The flashlink D-422-MG module provides an economical solution for transmitting RS-422 and GPI data signals via fiber optic cable. A pair of D-422-MG allows bi-directional transmission of up to 8 RS-422 and 16 GPI data lines for distances over 60km. When access to fiber is limited, D-422-MG can be combined with the flashlink optical multiplexing WDM, CWDM or DWDM products.

The D-422-MG module multiplexes up to 8 RS-422 and 16 GPI inputs into an outgoing datastream while at the same time demultiplexing an incoming datastream into 8 RS-422 and 16 GPI outputs. The outgoing multiplexed stream is available both as an optical signal and as an electrical signal for use with a flashlink multichannel DWDM system.

As stand alone unit, the D-422-MG module utilises 2 fiber strands for bi-directional data transport. Using either 2 fiber strands or optical multiplexing technology guarantees minimum possible latency for applications where timing is crucial. The D-422-MG module is supplied together with the D-422-MG-C1 connector module. The optical output is made with a Fabry-Perot laser diode for 1310±40nm or a DFB laser for 1550±40nm and the CWDM wavelengths according to ITU-T G.694 from 1470±6nm up to 1610±6nm.

The product is available in 17 versions:

D-422-MG-13T -7.5dBm	1310±40nm -7.5 dBm F-P laser
CWDM	
D-422-MG-C1470	1470±6nm 0dBm DFB laser
D-422-MG-C1490	1490±6nm 0dBm DFB laser
D-422-MG-C1510	1510±6nm 0dBm DFB laser
D-422-MG-C1530	1530±6nm 0dBm DFB laser
D-422-MG-C1550	1550±6nm 0dBm DFB laser
D-422-MG-C1570	1570±6nm 0dBm DFB laser
D-422-MG-C1590	1590±6nm 0dBm DFB laser
D-422-MG-C1610	1610±6nm 0dBm DFB laser
D-422-MG-C1270	1270±6nm 0dBm DFB laser
D-422-MG-C1290	1290±6nm 0dBm DFB laser
D-422-MG-C1310	1310±6nm 0dBm DFB laser
D-422-MG-C1330	1330±6nm 0dBm DFB laser
D-422-MG-C1350	1350±6nm 0dBm DFB laser
D-422-MG-C1370	1370±6nm 0dBm DFB laser
D-422-MG-C1390	1390±6nm 0dBm DFB laser
D-422-MG-C1410	1410±6nm 0dBm DFB laser

2 Specifications

2.1 Electrical

Power:	+5V DC 0.8A 4W,
Control:	Gyda system controller.
Monitoring:	Front panel LEDs and Gyda system controller
RS-422 Latency:	500ns maximum single direction latency including 1m of fiber. Additional latency 5µs/km of fiber.
GPI Latency:	5µs maximum single direction latency including 1m of fiber. Additional latency 5µs/km of fiber.

2.2 Inputs

2.2.1 RS-422

Signal format:	RS-422
Connector:	RJ-45
Bit Rate:	DC up to 115.2 kbps

2.2.2 GPI

Connector:	DSUB	25
Signal type:	Internal pull	up to 5V

2.2.3 Optical input

Sensitivity:	better than –30dBm
Max. input power:	-3dBm
Optical wavelengths:	1310nm, 1550nm
Transmission circuit fiber:	Multi Mode 50/125um, Single Mode 9/125um compatible
Return loss:	> 26dB
Connector:	SC/UPC, Return Loss better than 40dB

2.3 Outputs

2.3.1 RS-422

Signal format:	RS-422
Connector:	RJ-45
Bit Rate:	DC up to 115.2 kbps

2.3.2 GPI

Connector:	DSUB-25
Signal type:	Open collector transistor.
Maximum voltage:	30 V
Maximum current:	100 mA

2.3.3 Optical output

Transmission circuit fibre:	Single Mode
Light source:	F-P/DFB Laser
Optical wavelength (ver. 13T):	1310nm ±40nm
Optical power:	-7.5 dBm
Optical power (option):	0 dBm
Optical wavelength (ver. 15T):	1550nm ±40nm
Optical power:	0 dBm
Optical wavelength (ver. C1nn0):	1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610nm ±6nm as per ITU-T G.694.2
Optical power:	0 dBm
Jitter (UI=unit interval):	Max. 0.135 UI
Return loss:	Typ. > 40 dB
Maximum reflected power:	4%
Connector:	SC/UPC

3 Connector modules

3.1 D-422-MG-C1

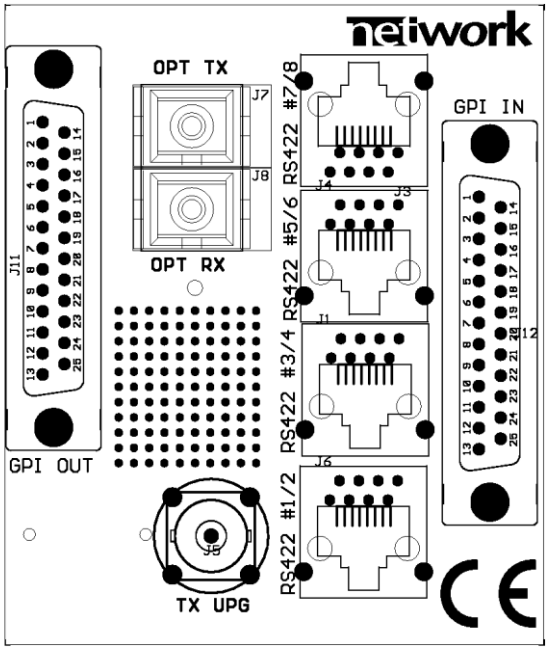


Figure 2: D-422-MG-C1 Connector module

The D-422-MG has a dedicated connector module: D-422-MG-C1. This module is mounted at the rear of the sub-rack. The module is shown in figure 2. Note that this connector module always occupies two (2) slots in the sub-rack.

3.2 D-422-MG-C2

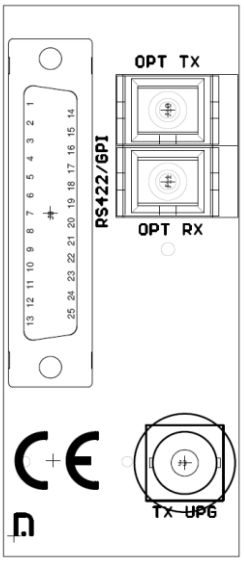


Figure 3: D-422-MG-C2 Connector module

The D-422-MG also has an alternative connector module: D-422-MG-C2. This module is mounted at the rear of the sub-rack. The module is shown in figure 3. Note that this connector module only occupies one slot in the sub-rack.

3.3 D-422-MG-C3

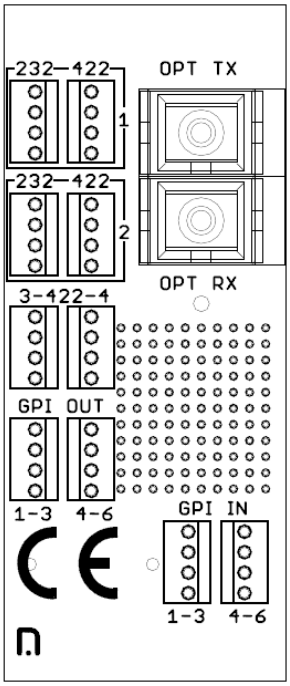


Figure 4: D-422-MG-C3 Connector module

The D-422-MG also has a third alternative connector module: D-422-MG-C3. This module is meant for Nevion FlashCase outside broadcast housing.

D-422-MG-C3 module use Molex KK connectors and interconnects with RJ45-KK included in most FlashCase variants. *D-422-MG-C3* is shown in figure 4. Note that this connector module only occupies one slot in the sub-rack.

3.4 Mounting the connector modules

The details of how the connector modules are mounted, can be found in the user manual for the sub-rack frame: FR-2RU-10-2.

This manual is available from our web site: http://www.nevion.com/

To set up a link, two D-422 modules must be used. The RS-422 data cable is connected to RS-422/E1 on each of the D-422 modules. The two modules are connected to the fibres with one fiber from TX on module 1 to RX on module 2, and from RX on module 1 to TX on module 2. The TX UPG connector contains an electrical version of the modulated signal running on the fiber. This connector is used for future upgrade with a flashlink multichannel DWDM system.

3.5 C1 RS-422 Connector Pin Assignments

RS-422 shall be connected to one of the RS-422 connectors, positioned as shown in figure 2. The connectors are RJ-45 style, 8-pin modular jacks. Each connector has two RS-422 ports, referred to as ports 1 and 2 in the below table. In the event that only one port is in use, an RJ-11 style 4/6 (4-wire, 6-position) jack can be used instead. Signals marked as inputs on the D-422-MG shall be connected to the outputs of the connected devices, and vice versa. The columns for DB9 VTR Master and Slave show which pin on the 9 pin DSUB should be connected to the signal. Note that when connecting an active device instead of a straight-through cable between a VTR master and slave (device and controller), one end of the active device must use a crossed cable. The table below takes the crossing on the slave side into consideration.

RS-422 pin layout:

Signal	Name	Port1	Port2	DB9 VTR Master	DB9 VTR Slave	Mode
RX +	Receive Pos.	Pin 3	Pin 1	Pin 3	Pin 7	Input
RX -	Receive Neg.	Pin 6	Pin 2	Pin 8	Pin 2	Input
TX +	Transmit Pos.	Pin 5	Pin 7	Pin 7	Pin 3	Output
TX -	Transmit Neg.	Pin 4	Pin 8	Pin 2	Pin 8	Output

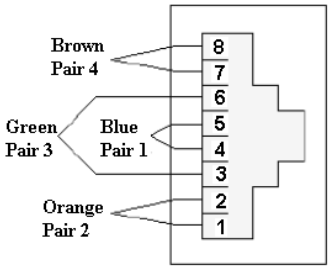


Figure 5: RS-422 outlet

3.6 C1 GPI Input Connector Pin Assignments

Input	Pin
1	12
2	24
3	23
4	10
5	9
6	21
7	20
8	7
9	6
10	18
11	17
12	4
13	3
14	15
15	14
16	1

GPI inputs shall be connected to the DB25 connector marked “GPI IN”. The pinout is the same as for the VikinX GPI panels, see table.

All inputs are internally connected to +5V via a pull-up resistor. The inputs will be activated when pulling them to Ground.

Ground is available on the following pins: 2, 5, 8, 11, 13, 16, 19, 22, 25 and on the connector chassis.

3.7 C1 GPI Output Connector Pin Assignments

Output	Pin
1	12
2	24
3	23
4	10
5	9
6	21
7	20
8	7
9	6
10	18
11	17
12	4
13	3
14	15
15	14
16	1

GPI outputs shall be connected to the DB25 connector marked “GPI OUT”. The pinout is the same as for the VikinX GPI panels, see table.

The GPI outputs are of open collector type. An output can switch a maximum load of 100mA at 30V.

Any device to be controlled by the GPI outputs (lamp, LED or similar) needs to be connected to an external supply voltage on one end and to the GPI output on the other end.

Ground is available on the following pins: 2, 5, 8, 11, 13, 16, 19, 22, 25 and on the connector chassis.

3.8 C2 DB25 Connector Pin Assignments

When sold with the C2 backplane, a subset of the inputs and outputs are available on a single DB25 connector with the following pinout:

Output	Pin
TX1+	1
TX1-	14
RX1+	15
RX1-	3
TX2+	4
TX2-	17
RX2+	18
RX2-	6
GPI IN1	7
GPI IN2	9
GPI IN3	10
GPI IN4	12
GPI OUT1	20
GPI OUT2	21
GPI OUT3	23
GPI OUT4	24

Signals marked as inputs on the D-422-MG shall be connected to the outputs of the connected devices, and vice versa. Note that when connecting an active device instead of a straight-through cable between a VTR master and slave (device and controller), one end of the active device must use a crossed cable (the VTR slave inputs are named TX and outputs are named RX).

The GPI inputs are internally connected to +5V via a pull-up resistor. The inputs will be activated when pulling them to Ground.

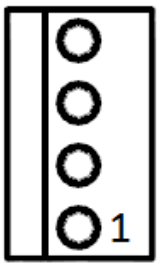
The GPI outputs are of open collector type. An output can switch a maximum load of 100mA at 30V.

Any device to be controlled by the GPI outputs (lamp, LED or similar) needs to be connected to an external supply voltage on one end and to the GPI output on the other end.

Ground is available on the following pins: 2, 5, 8, 11, 13, 16, 19, 22, 25 and on the connector chassis.

3.9 C3 Molex KK Connector Pin Assignments

When sold with the C3 backplane, a subset of the inputs and outputs are available on a several Molex KK connectors with the following pinouts:



RS422 connectors

Output	Pin
RX+	1
RX-	2
TX+	3
TX-	4

Signals marked as inputs on the D-422-MG shall be connected to the outputs of the connected devices, and vice versa. Note that when connecting an active device instead of a straight-through cable between a VTR master and slave (device and controller), one end of the active device must use a crossed cable (the VTR slave inputs are named TX and outputs are named RX).

Note that the RS232 ports 1 and 2 are unused when used with D-422-MG module

GPI IN connectors

Output	Pin
GPI IN1	1
GPI IN2	2
GPI IN3	3
Ground	4

Output	Pin
GPI IN4	1
GPI IN5	2
GPI IN6	3
Ground	4

The GPI inputs are internally connected to +5V via a pull-up resistor. The inputs will be activated when pulling them to Ground.

GPI OUT connectors

Output	Pin
GPI OUT 1	1
GPI OUT 2	2
GPI OUT 3	3
Ground	4

Output	Pin
GPI OUT 4	1
GPI OUT 5	2
GPI OUT 6	3
Ground	4

The GPI outputs are of open collector type. An output can switch a maximum load of 100mA at 30V.

Any device to be controlled by the GPI outputs (lamp, LED or similar) needs to be connected to an external supply voltage on one end and to the GPI output on the other end.

4 Remote control of Flashlink systems

For simplicity, this text refers to the card residing local to Multicon as the “local” card and the one at the other end of the fiber as the “remote” card.

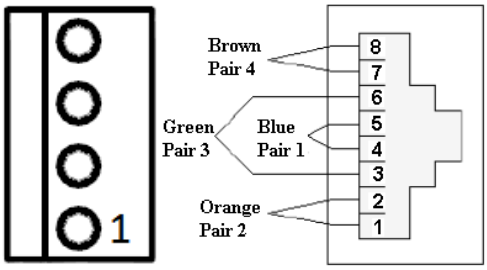
4.1 Requirements

Firmware revision 2.2.0 and FPGA revision 5 is needed on the card that sits local to Multicon for this feature to work. Any firmware/FPGA revision will work for the card in the remote end.

One RS422 channel (out of 2, 4 or 8 depending on backplane type) needs to be available. It must be the same channel for both cards, local and remote. The local card needs to be set up through the debug interface of Multicon (or PC with RS422 and serial port software).

4.2 Cable wiring

The local card is connecting as a normal Flashlink card, talking to Multicon. But we use an external cable to transmit data from Multicon directly to the fiber. Data from the fiber is transmitted by the on-board MCU on the internal flashlink bus. Therefore, we only need 2 wires, RX+ of D422-MG is connected to RX+ of the flashlink frame, and likewise with RX-.



C3 and C1 backplane connections, local card

D422-MG-C3	D422-MG-C1	Flashlink subrack
1	3	1
2	6	2
-	-	-
-	-	-

The remote card operates differently, here everything is done in the FPGA and both RX and TX are done over the external connectors . This D422-MG repeats requests from Multicon to the cards and responses from the cards to Multicon. Thus, for this end, RX of D422-MG needs to be connected to TX of the flashlink frame, and TX connected to RX. Always make sure + connects to + and - to -.

C3 and C1 backplane connections, remote card

D422-MG-C3	D422-MG-C1 (Port 1,3,5,7)	D422-MG-C1 (Port 2,3,6,8)	Flashlink
3	5	7	1
4	4	8	2
1	3	1	3
2	6	2	6

4.3 Turning remote control on

First you need to find the right address of the card.

Below you can se the card is in frame 0 position 4 but the software always start with 0 so this actually gives address 03. Valid addresses are 00 through 79.

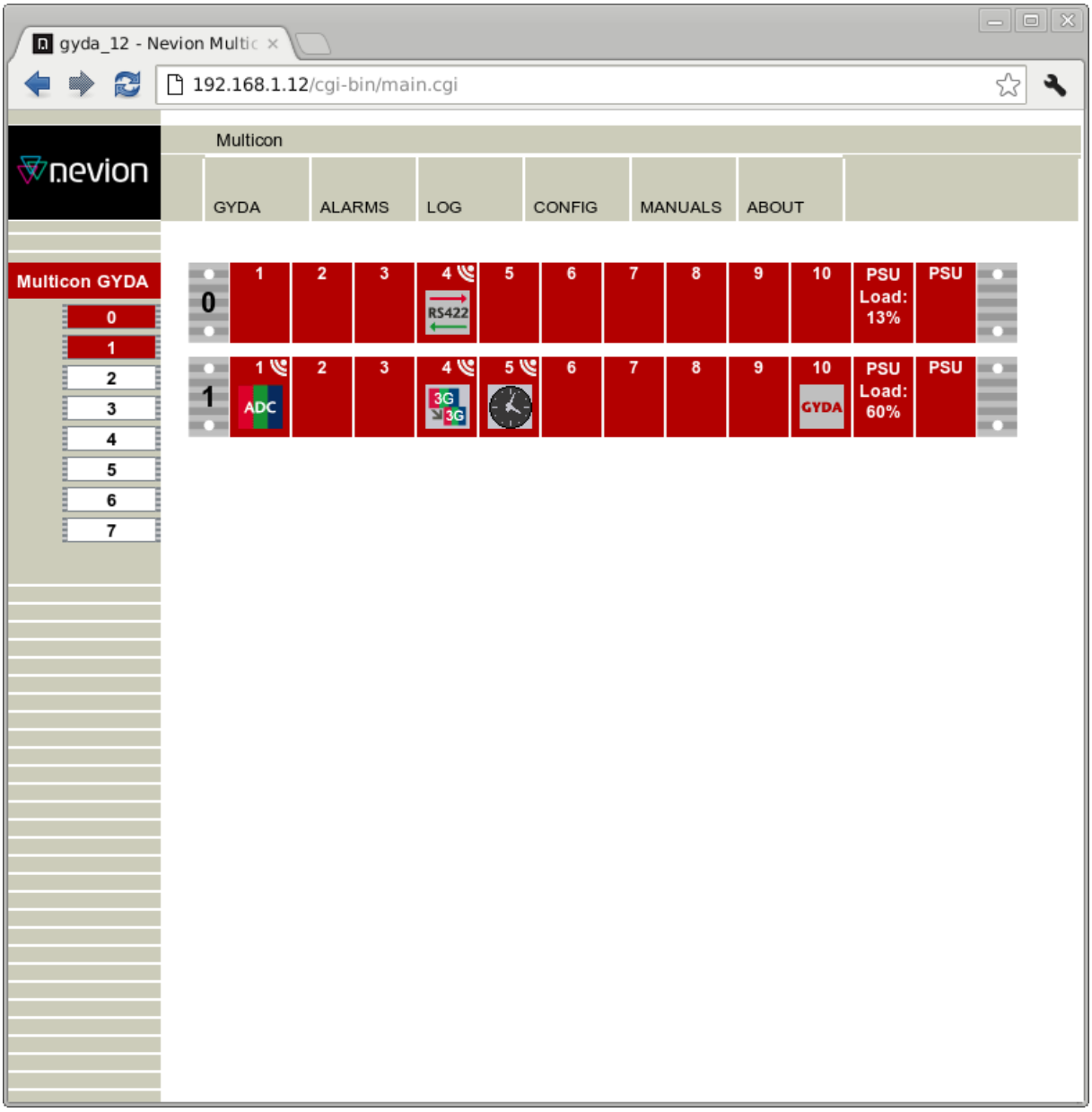


Figure 6: Local card in rack 0, pos 4.

Under the CONFIG tab at the top of the Multicon web interface (login required with administrative privileges, see Multicon manual for more info on this) there is an entry called “Debug terminal”. This can be used to send commands directly to the card, bypassing the web interface. The first command to use is a single question mark (in flashlink-terminology called “hello”). In our example below we put in “03” for “Card” and “?” for “Command”, then clicked “Ok”.

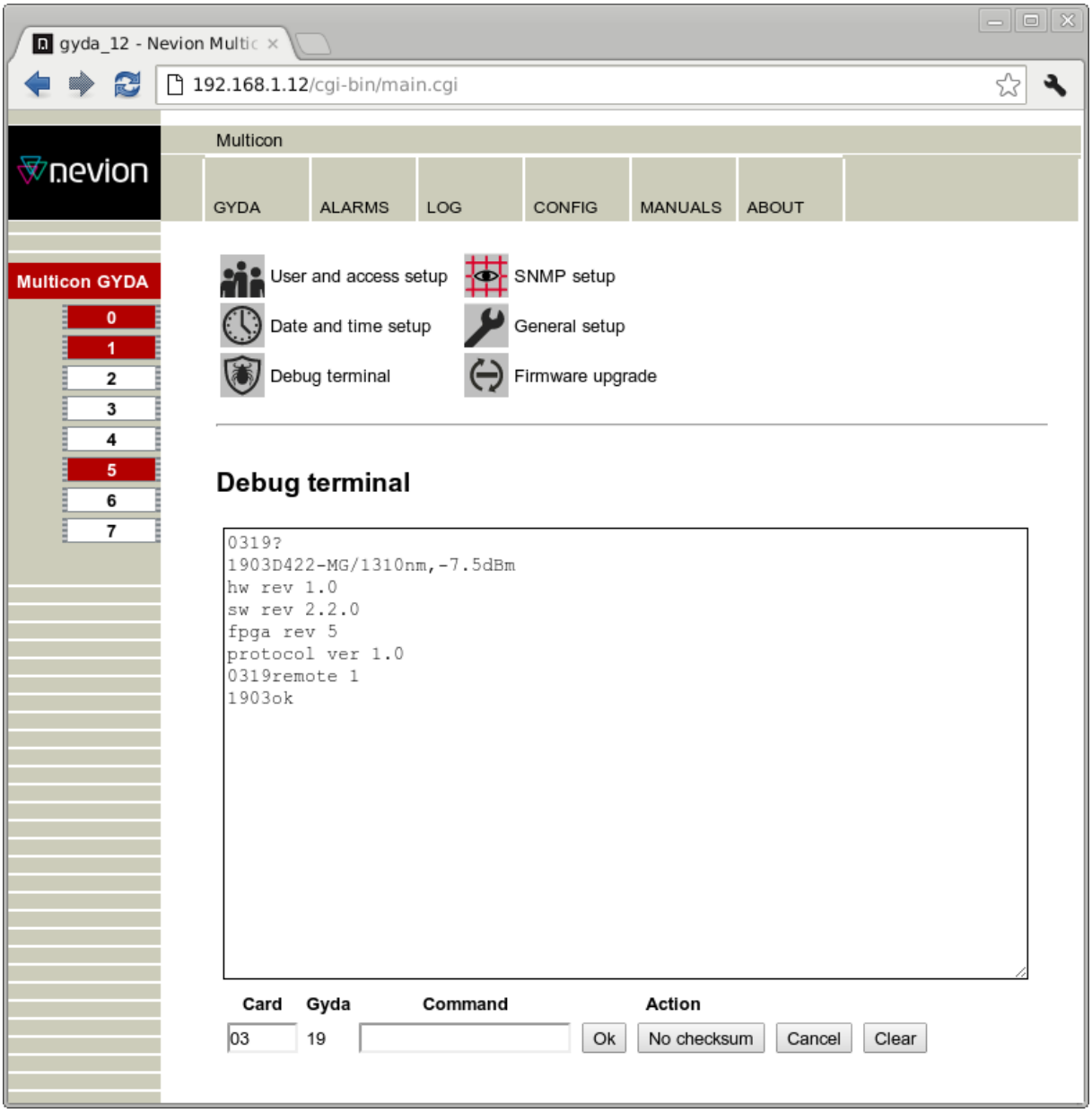


Figure 7:

The command “0319?” was then sent to the card, which responded with

1903D422-MG/1310nm,-7.5dBm
hw rev 1.0
sw rev 2.2.0
fpga rev 5
protocol ver 1.0

The command “remote” is used to enable or disable remote Flashlink control. To disable: “remote 0”. To enable on port 1 use the command “remote 1”, and so on up to port 8. The example above shows selecting port 1 for remote control. Below is shown the result, frame 5 was in our example sitting at the remote end of the D422-MG fiber link, and wired up according to the previous chapter.

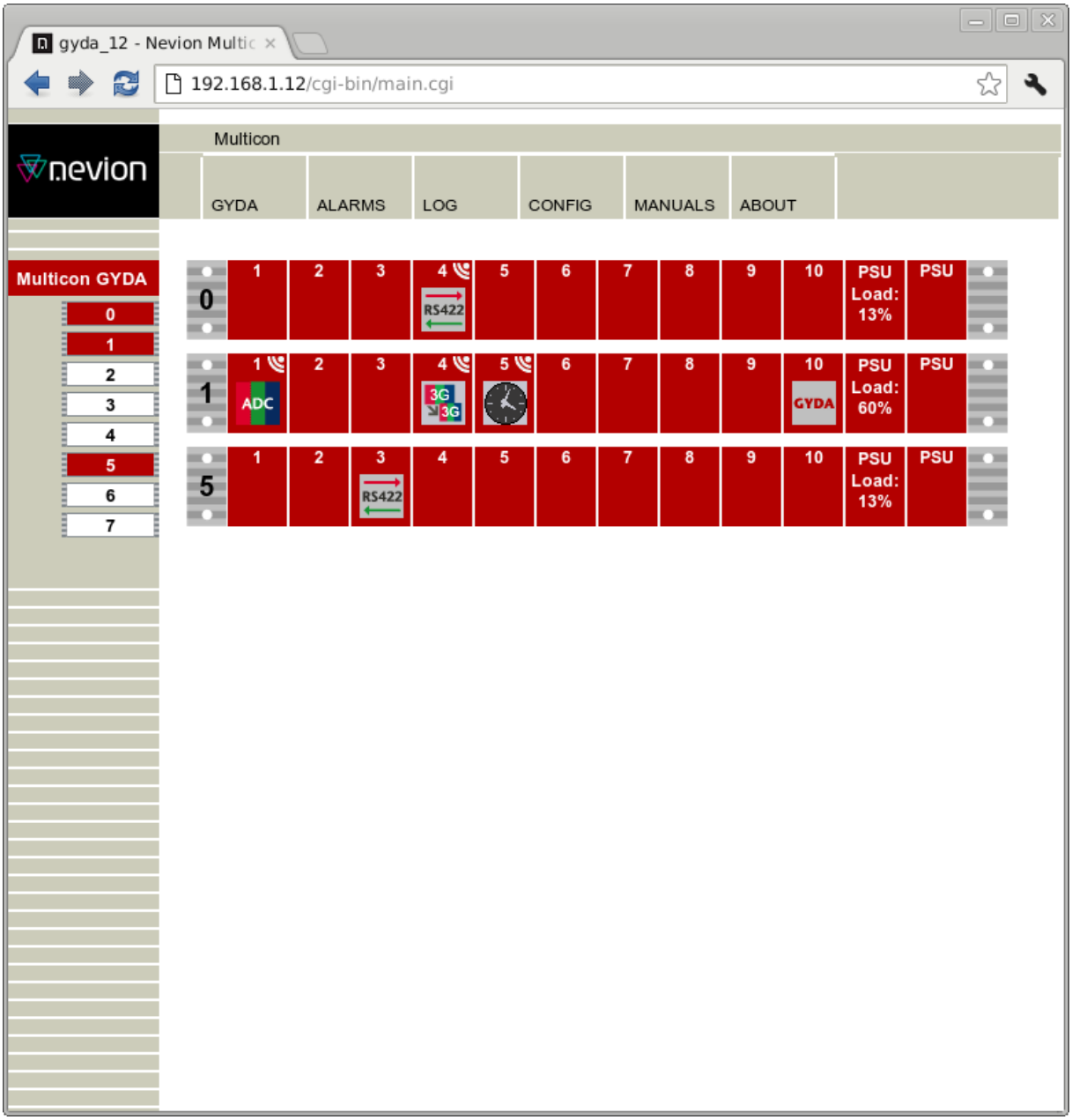


Figure 8:

Sending the command “remote conf” displays back which channel (if any) that is being used for remote Flashlink control. The readback uses same format as the “remote” command itself.

5 Operational status monitoring

The status of the module can be monitored in two ways.

GYDA system controller module.

LED's at the front of the sub-rack.

The LED's are mounted on the module itself, whereas the GYDA-SC controller is a separate flashlink module which presents the status of the flashlink modules in the frame(s) as a web site.

The functions of the two monitoring systems are described below.

5.1 GYDA – Monitoring and control

From within GYDA it is possible to have alarms on loss of signal, loss of reclocker lock, voltages, laser failure etc. As of firmware version 2.0.0 of D-422-MG it is also possible to have alarms on each of the 16 GPI inputs, as well as the 16 GPI outputs. Only the GPI inputs have alarms attached to them by default. Also, the same firmware version enables control of the GPI outputs, so each output can follow remote input, drive active low or set high impedance. All these functions are available from both web and SNMP. This means that spare GPI inputs and outputs on D-422-MG can be used to extend GYDA with more inputs and outputs.

5.2 Front Panel - Status Monitoring

The status of the module can be easily monitored visually by the LED's at the front of the module. The LED's are visible through the front panel as shown in the figure below.

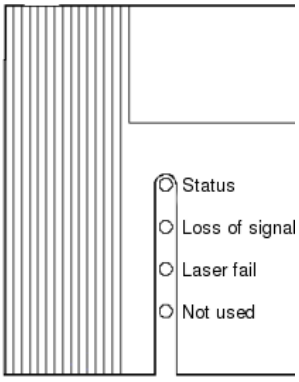


Figure 9: LED overview of D-422-MG

(Text not printed on the front panel).The D-422-MG has 3 LED's. The colours of each of the LED's have different meanings as shown in the table below.

Diode \ state	Red LED	Green LED	No light
Status	– Module initialising (takes app 1 sec). – The laser is turned off. – Module is faulty (fuse blown etc).	Module self-test is OK and power is present.	Module has no power.
Loss of signal	No optical input signal, check fibre connection and card in opposite end.	Optical input signal present.	
Laser fail	Laser is malfunctioning.	Laser is ok.	

6 Operation

Guidelines to limit hazards from laser exposure.

All the available EO units in the flashlink® range include a laser.

Therefore this note on laser safety should be read thoroughly.

The lasers emit light at wavelengths around 1310 nm or 1550 nm. This means that the human eye cannot see the beam, and the blink reflex cannot protect the eye. (The human eye can see light between 400 nm to 700 nm).

A laser beam can be harmful to the human eye (depending on laser power and exposure time). Therefore:

!! BE CAREFUL WHEN CONNECTING / DISCONNECTING FIBER PIGTAILS (ENDS).

NEVER LOOK DIRECTLY INTO THE PIGTAIL OF THE LASER/FIBER.

NEVER USE MICROSCOPES, MAGNIFYING GLASSES OR EYE LOUPES TO LOOK INTO A FIBER END.

USE LASER SAFETY GOGGLES BLOCKING LIGHT AT 1310 nm AND AT 1550 nm

Instruments exist to verify light output power: Power meters, IR-cards etc.

flashlink® features:

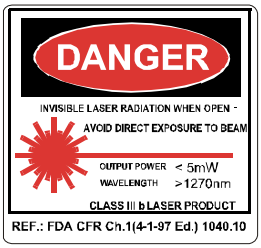
All the laser module cards in the flashlink® product range, are Class 1 laser products according to IEC 825-1 1993, and class I according to 21 CFR 1040.10 when used in normal operation.

More details can be found in the user manual for the FR-2RU-10-2 frame.

Maximum output power*: 5 mW.

Operating wavelengths: > 1270 nm.

**Max power is for safety analysis only and does not represent device performance.*



General environmental requirements for Nevion equipment

1. The equipment will meet the guaranteed performance specification under the following environmental conditions:
   - Operating room temperature range: 0°C to 45°C
   - Operating relative humidity range: Up to 90% (non-condensing)

2. The equipment will operate without damage under the following environmental conditions:
   - Temperature range: -10°C to 55°C
   - Relative humidity range: Up to 95% (non-condensing)

Product Warranty

The warranty terms and conditions for the product(s) covered by this manual follow the General Sales Conditions by Nevion, which are available on the company web site:

www.nevion.com

Appendix A Materials declaration and recycling information

A.1 Materials declaration

For product sold into China after 1st March 2007, we comply with the “Administrative Measure on the Control of Pollution by Electronic Information Products”. In the first stage of this legislation, content of six hazardous materials has to be declared. The table below shows the required information.

組成名稱 Part Name	Toxic or hazardous substances and elements					
	鉛 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr(VI))	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
D422-MG	O	O	O	O	O	O
O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006. X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.						

This is indicated by the product marking:

A.2 Recycling information

Nevion provides assistance to customers and recyclers through our web site http://www.nevion.com/. Please contact Nevion’s Customer Support for assistance with recycling if this site does not show the information you require.

Where it is not possible to return the product to Nevion or its agents for recycling, the following general information may be of assistance:

- Before attempting disassembly, ensure the product is completely disconnected from power and signal connections.
- All major parts are marked or labeled to show their material content.
- Depending on the date of manufacture, this product may contain lead in solder.
- Some circuit boards may contain battery-backed memory devices.